Journal of Practical Emergency Medicine. 2023; 10(1): e19

CASE REPORT

Rebar Impalement Trauma in a Construction Worker: a Case Report and Literature Review

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Received: June 2023; Accepted: July 2023; Published online: 14 August 2023

Abstract: Coincident impalement trauma to the neck and chest is infrequent but life-threatening. Our case was a 35-year-old man, who presented with rebar penetration injury to the neck and mediastinal area. He was conscious and his vital signs were stable. After initial imaging, the patient was transferred to the operation room for explorative surgery; however, as the rebar was loos in its site, we simply pulled out the rod. The patient developed acute respiratory distress syndrome (ARDS) during their administration and was eventually discharged without further complications and comorbidities.

Keywords: Trauma; Mediastinal penetrating trauma; Penetrating neck trauma; Penetrating trauma

Cite this article as: Jomeh Zadeh V, Yeganeh T, Zandbaf T, Behnia K, et al. Rebar Impalement Trauma in a Construction Worker: a Case Report and Literature Review. J Pract Emerg Med. 2023; 10(1): e19. https://doi.org/10.22037/jpem.v10i1.41942.

1. Introduction

Transmediastinal penetrating trauma (TMI) is a relatively uncommon condition, which predominantly happens in males. TMI usually occurs due to gunshots or stab wounds; however, it can happen due to an explosion or missile injury in warfare (1). In a sporadic manner, impalement can cause thoracic injury. The mortality of TMI is very high due to the presence of various vital organs, and the management is critical and complex (2).

Similarly, the neck also has a compaction of vital organs and thus, neck penetrating injuries are associated with high mortality as well. Although these injuries constitute less than 10 percent of trauma cases, their management is challenging. In both mediastinal and neck injuries, the object should not be hastily removed, as it may cause injuries to the surrounding tissue (1, 2).

Cases of thoracic injury by rebar impalement have been reported in the literature (3). Moreover, in another report, penetrating trauma by rebar has been reported in the neck region (4). We report a rare case of rebar impalement, penetrating both the neck and mediastinal region.

2. Case Presentation

A 35-year-old male building worker without any significant past medical history, presented at the trauma emergency room with penetration of a steel reinforcement bar with a diameter of 14 mm, commonly known as a rebar (Figure 1). The patient had fallen on a stationary rebar implanted on a surface and the rebar penetrated the second zone of the neck and entered the mediastinum. On admission, the patient was conscious, clinically stable, and had no respiratory distress or unstable vital signs. On physical examination, there was only little bleeding from the penetration site and no evidence of expanding hematoma or neurologic status alteration. Chest auscultation and movements were symmetric on both sides. The patient had a blood pressure of 105/65 mmHg, heart-rate of 101 beats per minute, respiratory rate of 20 breaths per minute, a temperature of 36.8 °c, and O2 saturation of 92%.

The patient's focused assessment with sonography for trauma (FAST) of internal chest organs showed no signs of pericardial or pleural effusion. A portable chest x-ray (CXR) imaging was conducted and as shown in figure 2, the rod passed the neck area and through the mediastinal space.

The patient was transferred to the operating room and underwent general anesthesia for the exploration of the neck

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Figure 1: Patients' status at the operation room.

and mediastinal area. After anesthesia, the rebar was loos in place and seemed not to impact any internal organs, so we decided to pull the rod out. The thoracic cavity was explored thoroughly and there was no evidence of damage to the diaphragm, pericardium or pleura or any other significant damages. There was no active bleeding and hemostasis was achieved. Finally, the impalement site was dressed. Then after, the patient was admitted to the intensive care unit for continuous monitoring of vital signs and any alarming symptoms that could result from late complications of such injuries. A neck and chest computed tomography (CT) scan was obtained to assess for other possible injuries; which yielded no significant findings. In the following day, the patient experienced acute respiratory distress syndrome (ARDS). The diagnosis of ARDS was made according to the presence of bilateral lung infiltration on CXR and a PaO2/FiO2 ratio of less than 300 mmHg. Moreover,

Figure 2: chest-x ray image of the patient at the emergency room.

an echocardiography was conducted in order to rule out cardiac sources. Fortunately, the patient responded well to the treatments and was discharged after four days with no further wound or respiratory complications during admission. The patient was followed up in an outpatient setting for three months during which he had no noteworthy complaints.

3. Discussion

The neck and mediastinum contain a variety of vital organs. Penetrating trauma to these two important regions can be life-threatening and associated with high mortality. Penetrating traumas to these regions can be caused by gunshot or stab wounds; however, there are few reports of impalement trauma by rebar. Impalement injuries can happen in different settings like road accidents, aircraft crashes, and in a construction site with rebar (5), as in our case. Wang et al. (4) reported a case of impalement injury to the neck area by rebar in a 55-year-old male construction worker during a fall from the third floor. The rod entered zone II of the left neck side and exited from zone III of the right side of the neck. The patient underwent neck exploration under general anesthesia. The rebar was successfully removed, and a prophylactic tracheotomy was performed. The hole was irrigated with antiseptics to remove the puss formed during the following days. They reported that after 12 months the wound had healed with no further complications. Akcam et al. (3) also reported a case of rebar impalement injury to the thorax. The metal bar entered the left side of the hemithorax and exited the right hemithorax. Considering the lower hemithorax injury and the possible splenic laceration, laparotomy, and thoracotomy with a clamshell incision were performed; however,

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there was no sign of abdominal organ injury. Still, the pericardium was injured, but there were no injuries to the lung, main vessels, and heart. The patient was discharged with no complications four days after foreign body removal.

In another study by Yoo et al. (6) a patient presented with an impalement injury by rebar that entered from the left shoulder, and damaged various structures, most notably the right atrium. Due to hemopericardium and bilateral hemothorax, the patient underwent emergent surgery. Various lacerations in the right atrium and left pulmonary artery were repaired, hemostasis was achieved, and subsequently, the rebar was removed. The patient survived the injury and was discharged and followed up with no notable complications.

There has also been a report of abdominal rebar impalement extending to the thoracic cavity, as reported in a study in 2023. A patient presented to emergency department with an impalement injury entering from the left flank and exiting the left. The patient underwent emergent explorative laparotomy and thoracotomy. The surgery revealed damage to the left diaphragm and moderate damage to the spleen which were managed accordingly. The patient was discharged 12 days later with an uneventful recovery. (7)

Although isolated impalement injury to the neck or thorax area is rare, concomitant penetration injury to the chest and neck areas is even more rare. Zhang et al. (8) proposed a simultaneous impalement injury by rebar to the head, neck, chest, abdomen, and scrotum regions in a 46-year-old man. Surgery was performed by a multi-disciplinary team including neurosurgeons, ENT, thoracic, urology, and general surgeons. The patient survived the condition and showed no complications in the following 3 months.

Our case had the same mechanism of injury as the case above. However, the management was different. We primarily pulled the rebar out of the body, as it was loose in its place and did not seem to impact any internal organs. However, all the reviewed studies reported that they extracted the rod during open surgery and exploration, as it was tight in its place. This should be noted as a point in the management of impalement injuries.

Immediate and emergent surgery is the key to the patient's survival in impalement injuries. Life-threatening problems like pneumothorax, hemothorax, and cardiac injuries should be suspected and assessed. FAST can be helpful in this regard and even a CXR can yield useful data (9). It should also be kept in mind that the impaled foreign body may have a role in hemostasis and its removal may increase the risk of bleeding. In our case, there was no evidence of dangerous injuries caused by the rebar and it was loose in its site, so even before surgical exploration, we decided to pull the rebar out as it had no hemostatic role, and it was appropriate to be removed early.

4. Conclusion

A conclusion cannot be based on only one case; however, we suggest that during the management of impalement injury cases, it may be beneficial to determine whether the bar is fixed in its place or not. In cases of loose impalement injuries with no evidence of vital organ impaction and no hemostatic role, a simple removal by pulling the object may help prevent additional invasive actions. Further studies are needed to confirm the effectiveness of this approach and to highlight the circumstances and criteria that would make a patient suitable for such a conservative approach.

5. Declarations

5.1. Acknowledgment

The authors would like to express their profound gratitude to the medical personnel involved in the treatment of this patient in the Taleghani Hospital.

5.2. Conflict of interest

None.

5.3. Funding and supports

This study did not receive any funding or grants from the company or institution.

5.4. Authors' contributions

V.J. and S.S performed the surgery and reviewed the literature, T.Y wrote the manuscript and reviewed the literature. T.Z reviewed the manuscript and literature. All authors read and approved the final manuscript.

5.5. Ethical statement

The study was conducted in accordance with the Declaration of Helsinki.

5.6. Informed consent

The patient's written consent was obtained for the publication of this case report.

5.7. Availability of supporting data

To protect the privacy of the participant the data cannot be shared.

5.8. Using artificial intelligence chatbots statement

The authors did not use artificial intelligence chat bots to write the manuscript.

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